Characterizing Asymmetric Information in International Equity Markets*

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Abstract

This paper studies the international portfolio flows of US investors to examine the information structure of international equity markets. We use an empirical model of portfolio flows with both public and private information to extract measures of trades due to private information. We find that such trades are highly correlated across countries. In particular, a common "global" factor accounts for about half of the variation in trades due to private information. We show that the global factor helps explain the cross section of international equity returns, after controlling for public information. The finding that a substantial portion of trades due to private information across countries contains the same common information challenges the conventional view that domestic investors have better private information about their home market than foreign investors.

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1 Introduction

A common view of international equity markets holds that domestic investors have private information about their home market that is not available to foreign investors. This "local" private information is believed to originate from superior knowledge of domestic firms or country-specific economic conditions. The conventional view is motivated by evidence on portfolio holdings, particularly the "home bias" phenomenon.[1] There is also some evidence that local investors make higher average trading profits than foreign investors. For example, Shukla and van Inwegen (1995) provide evidence that US mutual fund managers performed better than UK fund managers in investing in US stocks. Hau (2001) shows foreign traders have lower profits than their German counterparts when investing in German stocks. Choe, Kho and Stulz (2001) find a small informational advantage for local individual investors in Korea. In addition, Timmermann and Blake (2002) show that UK fund managers lost money from trying to time a number of foreign markets.

However, the conventional view has recently been challenged by other studies that suggest that foreign investors may actually outperform their domestic counterparts. Grinblatt and Keloharju (2000) and Karolyi (1999) focus on average trading profits in Finland and Japan, respectively, and find that foreign investors outperform local investors. Hamao and Mei (2001) find that foreign investors display market timing ability in Japan in the early (1974-1980) part of their data. Seasholes (2000) and Bailey, Mao, and Sirodom (2002) study trading around earnings announcements in Taiwan and Singapore and Thailand, respectively. They find that foreign investors tend to accumulate (sell) assets before the arrival of good (bad) news on the stocks. Finally, Froot and Ramadorai (2001) find that equity flows into 25 developed and emerging countries forecast both net asset values and NYSE prices of closed-end country funds, which they interpret as evidence that foreign investors have better information. All of these new findings are puzzling under the conventional view: it is hard to see why foreigners should have systematically better information about local firms.

This paper proposes a new perspective on private information that can address the puzzle raised by the recent findings. The key point is the existence of "global" private information which is relevant for trading in many foreign countries simultaneously. As one example, consider market research about the technology sector. Insights about the

[1] Home bias refers to the fact that the level of international portfolio investment is well below that suggested by models of international diversification (see Lewis, 1999, for a survey). In addition, foreign investors tend to hold those domestic securities that are more familiar to them. See, for example, Kang and Stulz (1997), Choe, Kho, and Stulz (1999), Dahlquist and Robertson (2001), and Ahearne, Griever, and Warnock (2001). For a survey on international capital flows and returns see Stulz (1999).

future of this sector in the US are likely to be important for the valuation of tech stocks in Europe as well. Thus, experience gained in the US market may give sophisticated US investors an advantage in recognizing global trends in technology. In this case, trades based on such global private information would help US investors outperform domestic investors in Europe.

The goal of the present paper is to explore whether global private information is important in international equity markets and whether US investors trade on it. We first propose measures of trades due to private information by US investors in eight developed country stock markets. We then focus on the correlation of US investors' trades due to private information *across the different markets*. If most private information were local, then this correlation should be low. For example, private information generated by market research about France that leads sophisticated US investors to purchase French equities should not help forecast returns in Germany, and therefore should not entail purchases of German equities. In contrast, the more private information is global, the higher the cross-country correlation of trades due to private information.

Our main result is that a global factor accounts for approximately half of the variation in trades due to private information.[2] This common factor is useful for forecasting returns in many countries and has an economically large impact on realized return variation. Our results thus imply that global private information plays an important role in the dynamics of international equity flows and returns. To the best of our knowledge, this is the first time that common private information has been shown to exist in international markets.[3]

The fact that global information matters for US investors is particularly intuitive, because information that is local for US investors is also global information. The sizeable volume of international trade and foreign direct investment originated in the US makes the US one of the largest trading partners for countries around the globe. In addition to international links at the sector or firm level, common (i.e. global) factors in business cycles could also be a source of correlated private information.[4] It is thus not implausible that private information signals on US equities also have information content for foreign equities.[5]

Relative to the literature, the paper makes three main contributions. The first is to

[2] This global factor in private information is obtained after removing the effects of global factors in public information as detailed below.

[3] The domestic asset pricing literature has also illustrated the potential role for common factors in private information to explain some time series properties of returns (e.g. Subrahmanyam (1991) and Chan (1993)).

[4] We consider some additional possible economic explanations for our findings in Section 4.3 below.

[5] Note that this advantage need not be limited to US investors; sophisticated investors in other countries could also spend the resources to obtain correlated private information. However, as our data set is limited to trades by US investors we can measure this effect in that country only.

construct new empirical measures of trades due to private information. A limitation of the existing empirical literature is the use of data sets from a specific country or short time periods. Here, we extract the private information from a comprehensive data set provided by the US Treasury. The data consist of monthly purchases and sales of equities in the eight major foreign markets by US investors over the 1977 to 2003 period.

Changes in the share of a foreign market held by US investors must be due to either public or private signals. The literature that examines international equity returns has uncovered many public information variables that are useful in explaining the cross section of expected returns (Karolyi and Stulz (2001)). We use these variables to extract the trades of US investors based on public information. We find that the standard instruments used to predict international equity returns also predict *gross* equity flows (purchases and sales) by US investors in these markets. The residuals from these regressions represent (noisy) measures of trades due to US investors' private information. We use the gross flows residuals to construct a measure of unanticipated *net* flows.[6] We label these initial estimates our "broad" measures of private information.

Using monthly data to extract private information contains a potentially serious identification problem: our broad measure may overstate the role of private information as trades due to (public) news released during the month are counted as trades "due to private information".[7] To solve this problem, we construct an alternative, "conservative" measure of private information by including contemporaneous (end-of-month) values of the public information variables and *returns* in the flow regressions. By construction, this measure is orthogonal to *any* public news released during the month that affects returns. Of course, this measure will understate the role of private information as all trades based on private information that increase prices during the month are now counted as trades due to public information. Thus, our conservative measure acts as a lower bound on the private information content of trades while our broad measure acts as an upper bound. Below, we show that our results are quite similar for the two measures and discuss any differences.

The second contribution is to examine the factor structure of the private information. Previous analyses of international expected return variation try to separate the influence of global and local risk factors. Here, we are interested in describing the extent to which measured private information displays significant global components. We extract these

[6] We provide evidence to show that our method of forecasting net flows from separate forecasts of gross purchases and sales results in a better measure of expected net flows than by forecasting them directly. Our modeling of expected net flows due to public information thus improves on the approaches in Bohn and Tesar (1996a,b), Brennan and Cao (1997), and Portes and Rey (2000).

[7] For example, US investors could be "trend followers" purchasing foreign equities in response to increasing foreign equity returns during the month (Froot et al. 2001).

components using factor analysis and emphasize that this requires a comprehensive data set like the one used in this paper. Our empirical tests show that a common or global factor exists in US investors' private information measured using either the broad or conservative methods. This common factor accounts for roughly 55 per cent of the total variation in private information of US investors.

The third contribution is to show that the global factor in private information predicts international equity returns. Portfolio theory hypothesizes that trades due to private information must forecast returns over longer holding periods, after controlling for public information (Hasbrouck (1991a,b)). In contrast, noise trades and other contaminants in our residuals will not have a long-run impact on prices. This leads to a test of our measure. We use the latent-factor model of Hansen and Hodrick (1980) and Gibbons and Ferson (1985) to model the cross section of expected international equity returns based on public information. Using our broad measure of private information, we then show that an unexpected net flow by US investors into foreign equity markets has a statistically significant positive effect on international equity returns in the current and following three months, holding the public information effects constant. Under our conservative measure, which is by construction orthogonal to contemporaneous returns, an unexpected net flow by US investors has a statistically significant effect on international equity markets' returns over a three month holding period. We conclude that US investors have significant private information about global markets.

We also find that there is a persistent price impact in the US equity market using both measures. This latter result supports the view that the common factor is derived from the signal that US investors get about US asset and goods markets. In addition, the private information effects are large economically as they can account for a significant amount of the *realized* return variation in the countries that we examine. Our results thus confirm that private information matters, but they challenge the conventional (i.e. country-specific) view of why it matters. Below we explain how our results can be interpreted in light of the home bias and familiarity literatures mentioned earlier.

The paper proceeds as follows. In Section 2, we outline our empirical approach. In Section 3, we present our data and our models of the expected components of international equity flows and returns. We also show how the private information contains global components. In Section 4, we document that our measures of private information can be used to forecast returns. We also discuss how our results are robust to alternative interpretations and give some economic motivations for them. In Section 5, we conclude.

2 The Asymmetric Information Framework

In this section we outline our framework and discuss how measures of private information can be obtained and empirical tests of private information effects may be performed.

2.1 Measuring trades due to private information

In a world where investors have constant absolute risk aversion and state variables are conditionally normally distributed with constant variance, individual portfolio demands are linear in the investor's *payoff-relevant information.* Payoff-relevant information contains all the information, public and private, that the investor would use in forecasting future values of asset returns as well as her non-asset income (e.g. Albuquerque et al. (2003)). Aggregating across all the individual demands yields a vector linear specification of the aggregate international portfolio flows of US investors (with each line representing an asset):

$$\mathrm{NF}_t^{US} = \Theta^z \Delta Z_t + \Theta^R R_t + \Theta^I \Delta I_t + \Theta^\sigma \Delta \sigma_t + u_t,$$

where NF_t^{US} is the aggregate net flows by *all* US investors, Z_t' is a vector of public information variables, R_t is the vector of excess returns on the risky assets, and I_t is a vector of all information revealed by past signals that remains payoff relevant during the current month.[8] We assume that all information in I_t is public and that it can be captured by past net flows in our empirical analysis. Indeed, if private information matters, then we would expect I_t to move around, and lagged flows to be significant.[9]

The residual $(\Theta^\sigma \Delta \sigma_t + u_t)$ represents the average private signal of US investors $\Delta \sigma_t$ and the aggregate amount of noise trading activity u_t. Private information signals can be directly related to returns if they are informative about future expected dividends, or indirectly if they represent signals about other variables that are in turn correlated with returns.[10] Also, each signal may be informative about a variety of assets. This can be the case if there is correlated private information as in the models of Subrahmanyam (1991) and Chan (1993).

[8] In general, it is not clear that a time-invariant "summary vector" exists in an equilibrium setup with private information. However, this is guaranteed if all past private information is revealed after finitely many periods, as in Townsend (1983). In Albuquerque et al. (2003) we exhibit a setup with this property in an equilibrium context.

[9] In our regressions below, the serial correlation of the residuals is very close to zero when lags of the dependent variable are incorporated in the regression. Thus, it seems that assuming that I_{t-1} is also observed by the econometrician is a good approximation.

[10] As an example, an investor might have private information about her labor income which could be correlated with the stock return of the firm she works for or of the other firms in the industry.

To obtain an empirical measure of aggregate private information from the net flows data, we first have to specify the econometrician's information set. Let

$$\widetilde{\Omega}_t = (Z_t, R_t, \left(Z_{t-h}, R_{t-h}, NF^{US}_{t-h}\right)_{h\geq 1})$$

describe the information used by the econometrician to predict net flows, where the time t variables are end-of-month variables. Measured residuals from a linear projection of the net flows on the information set $\tilde{\Omega}_t$ are:

$$\begin{aligned} \tilde{v}_t &\equiv \mathrm{NF}^{US}_t - E(\mathrm{NF}^{US}_t|\tilde{\Omega}_t) \\ &= \Theta^{\sigma}\Delta\sigma_t + u_t - E\left(\Theta^{\sigma}\Delta\sigma_t + u_t|\tilde{\Omega}_t\right). \end{aligned} \tag{1}$$

Residuals in the net flows regression are a noisy measure of the aggregate private information of the investors as they include noise trading activity u_t. Aggregate private information captures flows due to changes in the aggregate signal that cannot be forecast from public information and is the central variable of interest in this study. This private information is not available to any individual investor at the beginning of period t since it relies on knowledge of end-of-period variables. This is true for the econometrician as well. However, the residuals from a regression of realized net flows on the information set are an instrument for the aggregate private information of US investors.[11] Importantly, only private information signals have predictive power about future returns, though the existence of noise trading activity clouds the precision of the aggregate signal $(\Theta^{\sigma}\Delta\sigma_t + u_t)$. Below we show how to distinguish their effects on prices from those of the noise trades.

Note that the current period return R_t is included in the information set $\tilde{\Omega}_t$. This has two effects on our measure of private information. The first effect is to mitigate the impact of missing variables. This could be a serious problem as the econometrician may be missing some of the public information variables Z_t used by the agents. However, including current market returns removes this bias as public information variables are quickly incorporated into returns.[12] The second effect is that if private information is quickly incorporated into prices, then including current month returns would eliminate any private information effects as well. For these reasons, we label this our "conservative" measure of private information. We view this measure as providing a lower bound on the contribution of private information to unexpected flows.

[11] It is worthwhile to digress some more on what is the average private signal of US investors $\Delta\sigma_t$. Suppose first that each informed US investor receives an i.i.d. signal σ^i_t from the same distribution about future expected dividends. In a population of many infinitesimal US investors the average aggregate private signal $\sigma_t \equiv \int \sigma^i_t di$ constitutes a signal on the mean expect dividend with a *precision that is definitely higher than that of each of the individual signals.*

[12] Andersen et al. (2003) show that news about a number of public information variables are incorporated into stock prices within a 5 minute period.

For comparison, we also wish to provide a measure that acts as an upper bound on the contribution of private information. We therefore construct an alternative measure of private information using beginning-of-period values of the public information variables. Here, let $\Omega_t = \left(Z_{t-h}, R_{t-h}, NF^{US}_{t-h}\right)_{h\geq 1}$ so that no end-of-period variables are included. Using this information set the econometrician will recover the residuals

$$\upsilon_t \equiv \mathrm{NF}^{US}_t - E(\mathrm{NF}^{US}_t|\Omega_t). \tag{2}$$

We label this our "broad" measure of private information. We note that this measure may overstate the effects of private information if investors trade on unexpected public information released during the month. While our "conservative" measure of private information $\tilde{\upsilon}_t$ in (1) accounts for such public information news, it will understate the effects of private information which are incorporated into prices during the period. It turns out that our main results below are quite similar for the two measures.

Our focus is on the private information content of υ_t and $\tilde{\upsilon}_t$ that is relevant for forecasting unexpected returns. We note, however, that in some models, both private information measures could be related to hedge demands by the investors which do not impact returns. This is possible if the aggregate of US investors is small enough relative to the market. This is another potential source of noise in υ_t and $\tilde{\upsilon}_t$ and suggests that we might underestimate the impact of private information on returns.

We can use our two measures of private information to examine the structure of the information set used by investors in the international equity markets. It is standard to divide the public information vector Z_t into 'global variables' (such as the US interest rate, which affects equity prices in all of the countries), and 'local variables' (which may affect the equity return in a specific country). For the private information vector υ_t (or $\tilde{\upsilon}_t$) no natural labeling is available. However, suppose there is a linear combination of the broad measure private information

$$\Upsilon_t = \phi'_t \upsilon_t,$$

which explains a large fraction of the variance of υ_t. This suggests that there is a single indicator driving private information which is relevant for trading in *all* markets. In this sense, Υ_t is a 'global factor' in private information. We can also obtain $\widetilde{\Upsilon}_t = \widetilde{\phi}'_t \tilde{\upsilon}_t$ as the global factor in private information measured using the conservative measure. In either case, a global factor in private information is consistent with traders having private information about the global variables driving factor returns or about a systematic factor in asset prices as in Subrahmanyam (1991).[13] We construct such a factor below using

[13] Work by Chan (1993) shows that common factors in market-wide private information are important in explaining the cross-autocorrelation of domestic stock returns.

factor analysis.

2.2 Private information and equity returns

To test whether our measures of global private information (Υ_t and $\widetilde{\Upsilon}_t$) impact equity prices we need to specify an estimable model of returns. We adopt the latent-factor model of Hansen and Hodrick (1983) and Gibbons and Ferson (1985). In a $K-$factor model, the market price of risk of the k-th factor can be written as a linear combination of the set of L instruments $Z_t = (Z_{1,t}, ..., Z_{L,t})$ that are in the (public) information set of the econometrician. Thus, the process for one-period returns conditional on the econometrician's information is described by:

$$R_t = \beta\alpha Z_{t-1} + \beta f_t + \varepsilon_t, \tag{3}$$

where f is a $K \times 1$ vector of factor realizations with $E[f_t|Z_{t-1}] = 0$, $\beta = cov(R_t, f_t|Z_{t-1})$ is a constant $N \times K$ matrix, α is a $K \times L$ matrix, and f and ε are uncorrelated. In this model, the linear combination αZ_{t-1} represents the expected returns on the latent factors, while the β matrix is the loading of the assets on the factors. The latent-factor model of returns summarizes the public information relevant for forecasting returns in a parsimonious way. For example, under a one-factor model, the estimated combination αZ_{t-1} is often interpreted as the return on the 'global' factor which is relevant for all stock markets if world equity markets are integrated (e.g. Campbell and Hamao (1992)).

In this paper we wish to measure the effects of unanticipated net flows on unanticipated returns. Consider first evaluating the effects of our broad measure of global private information on returns. Since Z_{t-1} and Υ_t are uncorrelated, we require that

$$E\left[R_t|Z_{t-1}, \Upsilon_t\right] = \beta\alpha Z_{t-1} + \gamma\Upsilon_t.$$

where the $N \times 1$ vector γ measures the impact of unexpected net flows on the cross section of expected returns. Recall that the unanticipated net flows contain both private information and noise or liquidity trades. We therefore need to distinguish a positive impact due to private information from one that would result from price pressure due to the unexpected inflow of capital.

To overcome this difficulty, we test whether the price impact of the release of private information is long lived in the spirit of Hasbrouck (1991a,b).[14] Let R_t^{t+H} be the cumulative equity return from the beginning of period t to the end of period $t+H$. Hence,

[14] In Hasbrouck's microstructure tests, the release of private information has a *permanent* impact on future prices as he assumes expected returns are constant. This is not a very strong assumption as the tests span a short period of calendar time. In his tests, public information is assumed to be random and captured in the residual on the return equation in a vector autoregression. In the monthly

we estimate the system:

$$R_t^{t+H} = \beta_H \alpha_H Z_{t-1} + \gamma_H \Upsilon_t + \varepsilon_{H,t}, \tag{4}$$

for each holding period H. We extend the holding period H of the investor from $H = 0$, where the stocks are held for the current month, out to three months ($H = 3$).[15] As with the one-period model (3), the α_H coefficients capture the effects of time-varying returns on the latent factors over the holding period H while the β_H coefficients capture how the cross section of international returns respond to the factor returns. We note that different factors may capture expected return variation at different holding periods. The γ_H coefficients captures the effects of the global component in unanticipated trades over the different holding periods. Over short holding periods ($H = 0$), both private information and noise based trades could have an effect on returns. As the holding period lengthens, the γ_H coefficients will reflect the effects of private information only as noise based trades have a temporary impact. Thus the key test of the effects of private information on international equity returns is whether the γ_H coefficients are significant for longer holding periods.

Note that our method allows us to keep both the public and private information sets of the investor constant as we increase the holding period. As other investors observe the unanticipated trades of the US investors, they will be able to gain some knowledge of the private information. In effect, some private information will become public information. By holding the public information set constant, we can follow the tests advocated in the microstructure literature and estimate the effects of private information released at time t on future prices (returns) without allowing for this additional contamination.

We also test for the effects of our conservative measure of private information on returns. Since $\widetilde{\Upsilon}_t$ and R_t are uncorrelated, the $\widetilde{\gamma}_H$ coefficients from a projection similar to (4) will not be significant for $H = 0$ by construction. However, if private information does have long lived effects, then future months' returns will reflect the impact of private information released at time t. Therefore, our tests of the effects of the global factor in the conservative measures of private information follow the same form as (4) for holding periods $H = 1$ to 3 with $\widetilde{\Upsilon}_t$ replacing Υ_t.

The model is estimated by Generalized Method of Moments (GMM) separately for each holding period H. Consider projecting the cross section of the returns onto the the

observations used in this paper, the assumption of constant expected returns is questionable as returns vary in response to the release of public information. We thus test for the *long-lived* effects of private information on prices after accounting for time-varying expected returns.

[15] Cumby (1989) and Lewis (1990,1991) perform similar tests of longer holding periods in latent factor models.

instrument set Z_{t-1} and the private information Υ_t:

$$R_t^{t+H} = \Phi_H Z_{t-1} + \gamma_H \Upsilon_t + \varepsilon_{H,t}.$$

The model imposes a number of cross equation restrictions on the $N \times L$ coefficient matrix Φ_H. Under the model, the typical element of the matrix $\Phi_H = \beta_H \alpha_H$ is $\Phi_{H,n,l} = \sum_{k=1}^{K} \beta_{H,n,k} \alpha_{H,l,k}$, $n = 1, ..., N$ and $l = 1, ..., L$. However, the model is not identified and we follow the standard practice and assume $\beta_{H,1} = 1$ (for a one-factor model). Under these specifications, Φ_H has a reduced rank structure with rank$(\Phi_H) = K$. These restrictions can be used as a test of the model using the GMM J-statistic which is distributed as χ^2 with $(N - K)(L - K)$ degrees of freedom.[16]

Latent-variable models of international stock returns have been used by Harvey (1991), Campbell and Hamao (1992), and Harvey, Solnik and Zhou (1994) among others. The results of these studies are mixed. Campbell and Hamao (1992) examine the integration of the US and Japanese equity markets and find that a single latent-variable model is rejected during the 1970s but not during the 1980s. Harvey (1991) finds that the data reject a single source of risk across all of the world's equity markets, implying that the world market portfolio is not conditionally mean-variance efficient. However, the rejection is strongest for Japan; the model holds for the other countries examined in the paper. Harvey et al. (1994) find that a one to three latent-factor model is rejected by the cross section of 18 country index returns. However, when they examine the models' pricing errors and variance ratios, they find that a two or three latent-variable model captures the cross section of country returns.[17]

There are two reasons for adopting this latent-factor structure. First, the tests for private information effects outlined above require us to evaluate the impact of unexpected

[16] We use the Newey-West form of the asymptotic covariance matrix with the number of lags equal to $H + 3$ to capture any autocorrelation in $\varepsilon_{H,t}$. Ferson and Foerster (1994) examine the small-sample properties of latent-variable models estimated by GMM. They find that an iterated GMM procedure results in coefficient estimates with small biases but that the standard errors are understated. They propose a correction factor which results in appropriate sized standard errors. We use the iterated GMM approach and apply their small-sample correction factor to our standard errors.

[17] One of the key assumptions in the latent variable model is that the betas are constant. This not a strong assumption at the country level. Ferson and Harvey (1993) test an asset pricing model where the risk factors are global but the conditional betas depend on country-specific attributes. They are interested in the portion of variation of country returns that can be captured by time-varying risk premia as opposed to time-varying betas. They find that although time variation in the betas is statistically significant it contributes little to the variation in expected returns. Ferson and Harvey (1994) examine whether country-specific fundamental attributes can be used to help motivate time-varying beta models. Again, the risk premia are global while the betas are functions of specific country attributes which they label "fundamental determinants". They find some limited support for their model. However, the estimation approach used in both of these papers does not allow the cross-equation restrictions of a global asset pricing model to be imposed.

flows on unexpected returns. We thus use the "usual suspects" in Z_t which have been shown in many other studies to forecast international equity returns. Second, imposing the over-identifying restrictions of the latent-factor model results in more precise estimates of return variation due to the public and private information variables. This latter effect is important due to the noisiness of monthly return data.[18]

We note that there is no reason to believe that the global factor impacts returns in each individual country. This is because we construct the global factor using factor analysis which only requires that the linear combination $\phi_t' \upsilon_t$ is composed of some, but not all, of the elements in υ_t. As we stated in the introduction, if the global factor in private information is related to the global stock market return, then a sufficient test is the joint significance of the factor across all of the returns.

Below, we pursue the estimation of the measures of private information (υ_t and $\tilde{\upsilon}_t$), the global factors in each of the measures of private information (Υ_t and $\widetilde{\Upsilon}_t$) and their effects on the cross section of equity returns (γ_H and $\widetilde{\gamma}_H$) . Inference on these parameters is at the center of the empirical tests in the paper.

3 Modeling Expected International Flow and Return Variation

We separate our empirical analysis of the cross section of expected international equity flows and returns into three parts. In the first part, we describe the data. In the second part, we provide the results of the empirical model of international equity flows introduced in section 2.1 and describe how we construct our measures of private information. In the third part, we present the latent-variable model of the cross section of international equity returns.

3.1 Data

Our data on the international equity flows of US investors is obtained from the Treasury International Capital (TIC) reporting system of the US Treasury.[19] Financial institutions

[18] Note that alternative models for the cross section of expected international equity returns (e.g. the international version of the three-factor model presented in Fama and French (1998)) would use realized returns on sub-portfolios (e.g. international book-to-market portfolios) as proxy variables for the factor returns. These proxies would contain return variation due to the release of private information revealed by the trades of US investors during the month, thus invalidating the tests using our broad measures of private information.

[19] There are a number of related studies that use the same data set (Tesar and Werner (1993, 1995), Bohn and Tesar (1996a,b) and Brennan and Cao (1997)). See Froot et al. (2001) and Levich (1994) for a description of limitations/advantages of US Treasury data.

(banks, bank holding companies, securities brokers, dealers, and non-banking enterprises) must report to the Treasury each month on all of their transactions with foreigners in long-term securities (e.g. stocks and bonds) by country if their aggregate purchases or sales total more than US $2 million in the month. As a result, the Treasury receives comprehensive data on cross-border equity transactions for most US investors.

In this paper, we examine transactions by US investors in the equity markets of eight large developed countries – Germany, Japan, UK, France, Canada, Netherlands, Switzerland and Italy – which account for approximately 68 per cent of the market value of non-US markets at the end of our sample period. There are several advantages to limiting our analysis to these countries. First, using a group of relatively homogeneous, developed countries allows us to measure the public and private components of the trades correctly. Flows in and out of the equity markets in these countries are likely to be driven by stable economic relationships for which there is an abundant list of instruments. In contrast, the on-going process of liberalization of equity markets in developing countries leads to capital flows that are mostly driven by changing risk-sharing opportunities or declining transactions costs (e.g. Stulz (1999)). Distinguishing this effect from the asymmetric information effect in the flows would be difficult.

Second, as a result of the liberalizations, models of portfolio flows into emerging markets suffer from several statistical problems that make them difficult to estimate (e.g. non-stationarity due to structural breaks from changing foreign ownership restrictions). This is perhaps one of the reasons why researchers have focused on aggregated/regional data across these countries (e.g. Froot et al. (2001), and Bekaert et al. (1999)). Third, our data contain the net purchases of equities across a large cross section of countries with long, coincident time spans. This is typically not available in other data sets and is clearly necessary in order to measure common components in unexpected flows and their effects on asset prices.

However, there are two main deficiencies with the data. First, the Treasury does not collect data on transactions in derivative securities which have grown in importance in recent years. For example, investors may decide to take a position in an international equity market by purchasing a stock index futures contract at a lower transaction cost than investing directly in the equity market. To the best of our knowledge, this criticism applies to all datasets used in this literature. Second, and perhaps more importantly, the Treasury collects data by geographic center and not by the country of origin of the security. This means that the data may be unrepresentative for those countries that contain large international financial centers such as the UK and Switzerland. The typical example of this is a European company that is issuing securities in the Euro-equity market and sells the securities through banks in London to US investors. This transaction would be recorded as a sale of UK equity. Warnock and Cleaver (2002) examine the TIC data in detail and find that transactions to the UK are overstated while transaction to other countries are understated. This may bias our results against finding significant private information effects as the companies that are likely to issue equities via the Euro-equity market are large companies that are well known outside their home country (Marr et al. (1991)). However, these are the companies that foreign investors tend to hold, as noted above. Thus, the TIC would seem to capture disproportionately net flows for those companies that are less likely to be affected by global components of information.

The flows data all exhibit a trend growth as US investors (slowly) increase their net holdings of foreign equities. We thus follow the standard approach in the literature and normalize the flows data by dividing by the beginning-of-period value of the foreign equity market index.[20] Table 1a details our data set which ranges from January, 1977 (the start of the monthly TIC data) to May, 2003. The data are separated into gross purchases, gross sales and net purchases of foreign equities by US residents. The volume of transactions in the gross flows are much larger than in the net flows. US investors have purchased (sold) foreign equities in amounts ranging from 0.150 per cent (0.136 per cent) per month of the market value of Italian equities up to 0.865 per cent (0.825 per cent) per month of UK equities. The high volume of transactions in UK securities is likely overstated due to the presence of London as an international financial center. There is a much smaller volume of net purchases which range from 0.010 per cent per month for German or Dutch equities up to 0.047 per cent per month for Canadian equities. The gross flows have higher volatilities than the net flows as well as higher autocorrelations. However, all of the normalized series appear stationary.

We use the Datastream equity return index available at the end of each month to construct monthly returns. The indexes are based on the firms with the largest equity values in each country. As there is evidence that foreign investors tilt their portfolios towards the largest companies in each market, these indexes should be close to those returns actually obtained by US investors in foreign markets. The returns are translated into US dollars and the risk-free US interest rate is subtracted from them. Table 1b presents the summary statistics of the excess returns. We note that the volatility of the returns is much larger than that of the flows. This has implications below when we try to model the expected portions of flows and returns.

Portfolio flows and equity returns are contemporaneously correlated. Table 1c shows the correlation coefficients between the gross purchases, gross sales, and net purchases by US investors and the contemporaneous excess equity return in the country. Gross

[20] We use the Datastream total market index for the country's equity market and convert it to US dollars.

purchases have correlation coefficients ranging from -0.054 for flows into the UK up to 0.121 for flows into Italy. The correlations on gross sales are lower, with the figures for the Germany, Japan and the UK being negative. The correlation between net purchases and equity returns are larger than 0.10 for all countries except the UK (0.015), Switzerland (0.065) and Italy (0.094). This suggests either that US investors allocate funds to these countries when expected returns are high and/or that the purchases themselves drive up prices. Our test method presented in section 2.2 allows us to distinguish between these effects. The coefficients also suggest that the large volume of purchases and sales recorded for the UK and Switzerland are more likely due to activity in the Euro-equity market.

3.2 Modeling expected international equity flows

3.2.1 Public information sets

To estimate private information in the international equity markets, we need to separate the equity flows into expected and unexpected components. We use four different sets of public information variables to show that our results do not depend on which variables we choose.

In the first public information set (A), we use an autoregressive model to capture the expected portion of the flows. As noted in Table 1a, the flows are persistent and a sixth-order autoregressive model is able to capture a substantial portion of the expected flows. This is similar to the approach by Warther (1995) who uses autoregressive models for mutual fund flows.[21]

In the second and third information sets (B and C), we choose public information variables based on the belief that monthly international capital flows are related to the cross section of expected international returns.[22] The persistence in the flows is also consistent with the existing evidence that expected equity returns are time varying and persistent (see Chapter 7 in Campbell et al. (1997)). Hence, to model the expected portion of flows, we will use instruments that have been shown to predict the cross section of international equity returns.

In this literature, it is common to separate the instruments into two groups, global and local (e.g. Harvey (1991), Ferson and Harvey (1993,1994)), where the use of local variables is justified by the existence of incomplete risk sharing. From this literature we

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[21] Our tests are robust to the choice of lag length (results available on request).

[22] Bohn and Tesar (1996a,b) find that net purchases are related to the cross section of expected equity returns using a similar list of instruments. They also separate their instruments into local and global groups. Our approach differs by using the variables directly in modeling gross purchases and sales, which turn out to be much more predictable than net purchases.

select the short-term US interest rate, the US credit spread, the dividend yield on the global stock market, the slope of the US term structure and the US equity return to act as "global" variables. These variables can be thought of as capturing shocks to wealth and risk tolerance of US investors and are lagged by one period so they are observable by investors before any portfolio decisions would be made. The global variables, along with lagged flow variables to capture any missing expected flows, are used as our second data set (B). Table 1b provides the summary statistics of the global instruments, which resemble those in many other papers.[23]

We also select a number of "local" variables for each foreign country. These include: the lagged value of the country's stock return (to capture any return chasing activities by investors (Bohn and Tesar (1996a,b), Froot, O'Connell, Seasholes (2001)); the lagged value of the country's dividend yield and the difference in interest rates between the country and the US (to act as instruments for expected return variation specific to the country); and last month's change in the spot exchange rate of the country's currency against the US dollar (to capture any exchange rate effects). The third information set (C) thus contains lagged flows, and the global and local information variables.

To construct our fourth information set (D), we rely on the literature that examines the links between trading activity and market volatility. This literature shows a positive contemporaneous correlation between conditional volatility and trading volume (e.g. Lamoureux and Lastrapes (1990), Gallant et al. (1992)). As our international equity flows represent the trading activity of a specific group of investors, it may be that they are correlated with conditional volatility and that instruments which forecast time-varying second moments can also forecast the flows. We thus use a very simple autoregressive conditional heteroskedasticity (ARCH) type representation to capture these potential effects. We form a small vector autoregression (VAR of order 1) composed of the US excess equity return, the foreign country excess equity return and the change in the spot exchange rate between the two countries. The squared and lagged estimated residuals from this VAR act as instruments to forecast future flows. Again we include lagged flows to capture any of the missing variation.

[23] Most of the data are from Datastream. We use the 30-day Eurocurrency rate on the last business day of each month as the risk-free interest rate for each country. We use the Datastream equity return index and dividend yield on the index available at the end of each month. The dividend yield series is deseasonalized in the usual manner (we take the average dividend over the last 12 months and divide by the current price). The exchange rate is reported daily by Datastream in UK pounds and we translate the end-of-month values into US dollar equivalents. The US credit spread is the difference between the AAA and BBB bond yields available at the US Federal Reserve web site. The term structure slope is the long bond yield from the OECD database less the 30 day Eurodollar interest rate.

3.2.2 Regression results

Summary statistics for OLS regressions of gross purchases and gross sales on the four different information sets are presented in Tables 2a and 2b, respectively. These regressions use beginning-of-month values of the variables. The regressions using the end-of-month values produce similar results and are available on request. A simple AR(6) specification (information set A) is able to capture a large part of the expected flow variation with $\bar{R}^2$ measures (adjusted for degrees of freedom) ranging from 0.313 for France up to 0.948 for the UK for gross purchases by US residents. A similar range is recorded for gross sales by US residents. The combination of the lagged flow variables and the global instruments (information set B) also results in very high $\bar{R}^2$ measures for the gross flows. When we test the joint significance of the global variables (excluding lagged flows) we find that the restriction that all of the coefficients on the global instruments are zero is strongly rejected by the data for most countries. Thus, the global instruments that are typically used to explain the cross section of international equity returns also explain the cross section of international equity flows. It is clear, however, that most of the predictability comes from including the lagged values of the flows as the $\bar{R}^2$ statistics increase only marginally by including the global variables.

We test for the predictability of the local instruments by adding them to the existing regression (information set C). Table 2 shows the resulting $\bar{R}^2$ measures and the χ^2 tests of their joint significance. There is a small increase in the $\bar{R}^2$ statistics from adding the local variables to the regression except for those explaining gross purchases of Italian equities and gross sales of French and Italian equities. However, the local variables as a group are jointly significant at the 10 per cent level for equity flows in and out of about half of the countries.

The fourth information set (D) uses lagged values of squared residuals to capture any time variation in flows related to time-varying volatility. The statistics show that while these instruments are significant in some of the regressions, they do not help to explain time-variation in expected flows much beyond that captured by the lagged flow itself.

Most of the existing literature has focussed on explaining the expected component of *net* portfolio equity flows. While we find that the gross flows are quite predictable, the net flows are much less so. Table 2c provides the $\bar{R}^2$ and χ^2 statistics for the OLS regressions of the net equity flows on the four information sets. As can be seen, the amount of linear predictability in the net flows is much smaller than in the gross flows. The adjusted $\bar{R}^2$ statistics for the net flow regressions are below their counterparts for the gross flow regressions, with the former ranging from 0.015 for Italy to 0.310 for Japan using the six lagged net flows as regressors (instrument set A). The global, local and heteroskedastic variables also do not appear to capture much of the predictability in the net flows regressions.[24]

It appears that much of the predictability in our gross flow regressions comes from modeling the autocorrelation structure of the data. Bohn and Tesar (1996a) note the strong autocorrelation in the *net* purchases data. They view this as a challenge for portfolio theory as investors should adjust their portfolios in response to news about expected returns which have little serial correlation. In our approach this is justified by assuming that lagged flows are good proxies for past information not in the econometrician's information set. In general, there are other economic reasons to believe that flows exhibit "momentum" (Bohn and Tesar (1996a)). First, financial firms may set long-run asset holding targets that lead to smoothing and slowly trending flows. Second, herding by US investors at low frequencies would also deliver autocorrelation of flows.

Our results also have interest for more general international asset pricing applications that use similar forecasting variables. One potential criticism of most asset pricing applications is that many of these variables have been chosen by an on-going implicit process of data snooping; i.e. choosing the variables based on ex-post statistical criteria of return predictability. To the extent that the flows data represent new sources of information (given the correlations in Table 1c), the (limited) predictability shown here may alleviate some of these concerns.

3.2.3 Constructing measures of private information of US investors

The regressions detailed in the previous section give us a way of estimating the expected portion of the gross and net portfolio equity flows. Following our derivations in section 2, the private information of the US residents can be estimated by the unexpected portion of the net equity flows.[25] In this subsection we discuss only the construction of our broad measure of private information, and note that the exact same steps apply for our conservative measure.

Recall from equation (2) that the vector of our broad measures of private information is obtained from the unexpected net portfolio flows into the equity markets of the eight

[24] The small amount of predictability due to the global and local instruments for both the gross and net flows is somewhat surprising given the relationships found in the domestic market literature. For example, Hasbrouck and Seppi (2001) find that statistical factors in the cross section of order flows are related to those in the cross section of returns on the 30 Dow Jones stocks. Lo and Wang (2000) find that some of the standard instruments used to predict stock market returns help predict turnover of the NYSE-AMEX stocks.

[25] Kaufmann, Mehrez, and Schmukler (1999) proceed in a similar fashion to obtain a measure of private information. They use survey data on firm managers' assessments of how the economy will preform. The advantage of using flow data is that investors actually "put their money where their mouth is."

foreign countries and is denoted by $\upsilon_t = (\upsilon_{1,t}, \ldots, \upsilon_{8,t})$. Our regression results allow two possible routes to estimating υ_t. One is to use net purchases of equities by US investors in each foreign country as the dependent variable (Table 2c). The residual from that regression is υ_t as desired. An alternative route is to estimate the regressions for gross sales and gross purchases separately and let

$$\upsilon_{n,t} = \upsilon_{n,t}^P - \upsilon_{n,t}^S, \tag{5}$$

where $\upsilon_{n,t}^P$ and $\upsilon_{n,t}^S$ are the residuals from the gross purchases and gross sales regressions (Tables 2a and 2b), respectively.

Although the gross flow regressions show substantially greater explanatory power than their net flow counterparts, it is uncertain as to whether the expected portion of the net flows are modelled better by using the difference between the expected gross flows or by using the net flows directly in a regression. To answer this, we can construct an expected net flow variance ratio. The numerator is the variance of the expected net flow from the net flow regressions (Table 2c). The denominator is the variance of the implied expected net flow constructed using the difference between the expected gross purchases and expected gross sales (Tables 2a,b). A ratio below 1.0 indicates that the approach using the gross flow regressions is to be preferred. We can also test whether this difference is statistically significant. We regress the net flows on both the lagged gross purchases and gross sales and test if the coefficients on the two sets of variables are equal (and opposite in sign). The resulting test statistic is χ^2 distributed with six degrees of freedom (using the sixth-order autoregressive model).

Table 3 presents the estimated variance ratios and the asymptotic marginal significance levels (P-values) of the test statistics. For all countries and information sets, the ratios are below 1.0, often by a substantial amount. It appears that this result is primarily driven by the different time-series properties of the gross purchases and sales which are obscured when one models net flows directly. This is shown in the first column of the table which compares the variances of the estimates using the AR models for the flows. Adding on other information variables to the basic AR specification raises the variance ratios in all cases. The P-values indicate that the differences between the coefficients on the lagged purchases and sales are statistically different at the 10 per cent level in six of the eight countries examined for instrument sets A and C. In the following, therefore, we use the gross flow residuals to construct our measures of private information.

As mentioned above, if US investors have significant private information about the foreign equity markets, this is likely to come from their analysis of global factors. We can use the variance-covariance matrix of υ_t to test this hypothesis. We perform a factor analysis on the residuals from the gross purchases and sales regressions separately ($\upsilon_{n,t}^P$

and $\upsilon^S_{n,t}$, $n = 1, ..., N$). The factor analysis is done by both the method of iterated principal factors and by maximum-likelihood estimation. The results presented below are very similar across the two methods.

Table 4 presents the results of the factor analysis on the residuals from the gross flow regressions using the lagged flows, global and local variables (instrument set C) for the broad measure of private information. The results for the conservative measure are similar and available on request. The first factor captures 52.6 per cent of the unanticipated purchases and 55.3 per cent of the unanticipated sales. Adding in the next two factors raises the total variation captured to over 85 per cent of gross purchases and sales. We can perform likelihood-ratio tests for the number of factors using the results of the maximum-likelihood factor method. The tests reject the hypothesis that no factors are present in the residuals but give conflicting results about the precise number of factors. The gross purchases residuals reject a one-factor representation in favor of two factors with a P-value of 0.003 per cent. However, a representation involving more than one factor model is rejected for the gross sales residuals. Tests reject more than two factors for both sets of residuals (not reported). Clearly then, the covariance matrices of the gross flow residuals show reduced rank structures associated with a common factor representation in total private information.[26]

To measure the impact of global information in net flows, we obtain the factors estimated using the maximum likelihood method on the gross purchases and sales residuals. As the scale of the factors is arbitrary, we normalize each to have a standard deviation equal to the simple average standard deviation of its constituent residuals. We can then obtain a measure of the global factor in net flows as

$$\Upsilon_t = \Upsilon^P_t - \Upsilon^S_t, \tag{6}$$

where $\Upsilon^P_t$and Υ^S_t are the (normalized) global factors in the residuals from the gross purchases and sales residuals, respectively.

3.3 Modeling expected international equity returns

To show that our global (public information) instrument set is able to capture time-varying expected returns, we follow the literature and present some initial OLS regressions of the excess stock returns on the global instruments without imposing any of the restrictions of the asset pricing model or including the effects of private information.

[26] Froot et al. (2001) showed in the earlier versions of the paper that there is an important regional factor in *expected* flows. We have removed the expected portion of the flows using the global and local instrument sets and our factor analysis is thus concerned with *unexpected* flows.

Table 5 presents the $\bar{R}^2$ measures (adjusted for degrees of freedom) as well as the χ^2 statistic of the test that the global variables are jointly insignificant. The low value of the $\bar{R}^2$ statistics is typical in the equity return prediction literature. The χ^2 statistics do show however, that the global variables are significant at the 5 per cent level for 4 of the 9 countries (Germany, Japan, Netherlands and Switzerland) and significant at the 10 per cent level for the US. The instruments are not significant at standard levels for the UK, French, Canadian or Italian equity returns.

We also test whether the same local instruments that were used in the flow regressions also are able to capture expected return variation. When these variables are included there is only a small increase in the degree of linear predictability in some of the countries (Table 5). In addition, the χ^2 statistics show that the local variables are significant at the 10 per cent level for the UK only (P-value of 0.088). Thus, it appears that the cross-section of international equity returns can be modelled by the global instrument set alone.[27]

We estimate the latent factor model (4) without any private information to examine how it captures expected return variation. Imposing the restrictions of the latent-variable model leads to precise estimates of the coefficients on the global information variables. Table 6a presents the estimated α_H coefficients for holding periods ranging from the current month ($H = 0$) to three months forward ($H = 3$). The coefficients are statistically significant on most of the variables (except the intercept) at most forecast horizons. The coefficient on the short-term US interest rate is negative as has been shown in other studies. The coefficient of the credit spread is significant and negative at all forecast horizons. The global dividend yield is shown to have a positive and significant effect on international returns. The slope of the US term structure and the lagged US equity market return change signs and are significant at some forecast horizons, indicating that their effects on expected equity return variation depend on the holding period examined.

The estimated β_H coefficients are presented in Table 6b. Recall that the coefficient on the US equity returns is normalized to 1.00 for identification. The coefficients are precisely estimated for most of the foreign country returns. For the current month ($H = 0$), the coefficients range from 1.0 for the US returns up to 3.4 for Swiss returns. All of the coefficients are significant at the 10 per cent level indicating that the single global factor forecasts the cross section of international returns. As the holding period H lengthens,

[27] This is a different picture than the one given for flows where local factors were shown to (marginally) increase the models' explanatory power. If these local variables represent the effects of a local factor in flows then it may be that there is also a local factor in returns. However, the return regressions may not capture this factor as returns are much noisier than flows. This does not affect our tests below as the measures of private information constructed using instrument set C are orthogonal to these variables.

the Japanese coefficients decrease so that they are negative for a three month holding period. The poor showing for Japanese returns is in line with the results in many other papers (e.g. Campbell and Hamao (1992), Harvey (1991)) and suggest that the Japanese equity market is not integrated with world markets. In addition, the Canadian and Italian coefficients become insignificant. This may be indicating either that these equity returns respond differently to the global risk factor as the forecast horizon lengthens or that the model may be missing an additional risk factor.[28]

The model is able to capture return variation due to public information. To show this, we construct a variance-ratio statistic similar to the ones presented by Campbell and Hamao (1992) and Harvey (1991). The numerator is the variance of the fitted values from equation (4), denoted $var(\hat{\beta}_H \hat{\alpha}_H Z_{t-1})$, where $\hat{\beta}_H$ and $\hat{\alpha}_H$ are the GMM coefficients for holding period H given in Tables 6a and 6b, respectively. The denominator is the variance of the fitted values from an OLS regression of the excess return on the global instruments $var(\widehat{\delta} Z_{t-1})$. The variance ratio thus shows how imposing the baseline model's over-identifying restrictions leads to a degradation of the data's ability to forecast expected returns.

The results are presented in Table 6c. As can be seen, the latent-variable model does a good job at capturing expected return variation. The ratios range from 0.140 for Japanese returns up to 1.751 for Swiss returns during the current month ($H = 0$). As the holding period lengthens, the impact of the model's restrictions increases for some countries and the ratios fall (e.g. Canadian and Swiss returns). Some of the other ratios increase (e.g. German and Dutch returns).

In Table 6c, we also present the J-statistics that evaluate the over-identifying restrictions of the latent-variable model. The J-statistics show that the model is not rejected at any forecast horizon. Given the performance of the one-factor latent-variable model according to all of these metrics, we will use it as our model of public information in the subsequent tests.

4 Private Information Test Results

Equipped with our measures of US investors' private information and a baseline model of expected return variation, we now analyze whether the release of private information affects returns. We start by presenting our results on the impact of global private information. We follow with a simple economic metric to evaluate the importance of the

[28] We note below that our results using the conservative measures of private information are robust to missing risk factors.

private information. Finally, we explain how our results can be interpreted and why alternative explanations are unlikely.

4.1 Impact of global private information

The top panel of Table 7 presents the value of the chi-squared statistics associated with the Wald test of the null hypothesis that all of the γ_H coefficients in (4) based on our global factor from the broad measure of private information (6) are jointly equal to zero.[29] The low P-values indicates that the global factor is jointly significant across all of the foreign countries and holding periods regardless of the instrument set used to construct the expected equity flows. The bottom panel of the table shows the corresponding tests for the conservative measure of private information.[30] Overall the tests statistics based on the conservative measures are lower as they are orthogonal to contemporaneous information. As the conservative measures using instrument sets B and C are orthogonal to contemporaneous stock returns, they are not statistically significant in the current month ($H = 0$). However, the global factor based on the conservative measures is statistically significant over longer holding periods ($H = 1$ to 3 months).

Table 8a presents the individual γ_H coefficients on the broad measures of private information over the different holding periods using the global and local information variables in the flow regressions (instrument set C). Each coefficient is presented with the small-sample standard error and P-value. The joint significance tests presented in Table 7 are repeated here for convenience. The coefficients are positive for all of the returns in the current month ($H = 0$) indicating that the private information available to US investors leads to higher stock returns. As US residents make an unexpected net purchase of foreign stocks, foreign stock indexes rise. We note that the global factor is positive and significant for US equity returns even though the factor was constructed from net purchases in foreign equity markets. The fact that the global factor is positively related to both US and foreign equity returns indicates that it is related to the common component present in world-wide equity returns.

The magnitude of the coefficients is in basis points. Thus a one basis point increase in the (normalized value of) US net purchases in all foreign markets leads to a 8.5 basis point increase in UK excess equity returns (measured in US dollars). Below, we present some

[29] Some authors (e.g. Harvey and Zhou (1993)) have noted potential problems with Wald tests in systems with instrumental variables and have advocated calculating the Gallant-Jorgensen (1979) (G-J) test statistic as well. We have calculated the G-J test statistics and found that all of the G-J statistics are larger in value than our reported Wald statistics. Both test statistics are χ^2 distributed with 8 degrees of freedom.

[30] Note that there is no conservative measure of private information using instrument set A as it contains only lagged values of the flow series.

variance-ratio statistics to get a better measure of the economic importance of private information on returns. The individual coefficients are significant at the 10 per cent level for all but two of the equity returns (German and Japanese stocks are the exceptions).

The release of private information has a long-run *price* impact as the coefficients over longer holding periods ($H = 1$ to $H = 3$) are also mostly positive and statistically significant. Some of the estimated coefficients measuring the effects of private information on Japanese, UK and Swiss equity returns are poorly estimated. This is likely due to two separate effects. Japanese returns are likely not integrated with other international equity market returns as shown in the tests in section 3.3 above. The measures for the UK and Swiss returns are problematic due to these countries acting as financial centers. In addition, the coefficients on the French returns are small and insignificant.

Table 8b presents the estimated $\widetilde{\gamma}_H$ coefficients on the global factor constructed using the conservative measures of private information. Recall that our conservative measure of private information uses the end-of-month values of all of the forecasting variables to remove any potential simultaneity problems where flows respond to realized returns or other public information released during the month. Thus, our results are also free of any potential bias due to contemporaneous trend following of US investors in many foreign markets. However, for the same reason, the conservative measure will not capture a lot of the private information released during the month. As a result, obtaining precise estimates of the individual country's loadings on the global factor in private information will be more difficult.

Table 8b bears out this intuition. During the current month ($H = 0$), the coefficients are not statistically significant as the estimated private information shock is orthogonal to both US and foreign country contemporaneous returns. Over longer holding periods, the individual country coefficients are smaller than their counterparts for the broad measure. However, the coefficients are jointly significant for holding periods of a month or more. In addition, the coefficients are mostly positive, indicating that as US investors make unexpected purchases across all of the foreign countries the foreign equity indexes rise in response to the release of private information. The only coefficient that is negative at the three month holding period ($H = 3$) is the one on French returns which was small and insignificant even using the broad measure. As before, the impact of US private information on Japanese returns is very small.

To summarize, the joint tests using the conservative and broad measures both show that the unexpected component of US residents net purchases of foreign securities leads to a long-run increase in the prices of the stocks. As these measures provide lower and upper bounds on the private information set of the US investors, we conclude that the investors have significant private information about international equity markets. In particular, the global factor in their private information predicts both US and foreign equity returns.[31] We attribute this to US investors having significant private information about US based factors. Given the size of the US market and its integration with other markets, this information will help them allocate assets around the world. As they trade, this information gets impounded into prices. Below we discuss several potential alternative explanations and show why they are unlikely.

The long-lived nature of the private information found in this paper may be surprising to some. However, other papers that examine higher-frequency data on international portfolio transactions also find that there is a persistent impact of unexpected net flows on returns. Froot et al. (2001) estimate a VAR on daily flows and returns similar to that of Hasbrouck (1991a) and find persistent price impacts from unexpected flows that last for at least 60 days.[32] However, they are unable to determine whether this low-frequency predictability is caused by the private information of US investors or by price pressure. In a subsequent analysis, Froot and Ramadorai (2001) use closed-end country fund data to separate the effects of private information from price pressure. They find evidence in favor of the information story with US investor flows resulting in persistent price impacts that last for several weeks. However, as they note, using such an approach depends on the adequacy of the model of closed-end fund demand.

By relying on a longer data set and an asset-pricing model, our approach examines the low-frequency predictability more directly. In particular, we can account for the autocorrelation in the gross flows as well as the effects of public information releases on both flows and returns. The results show a significant impact of total private information on international equity returns. We note that this information is superior relative to *all* non-US investors; US investors may not have superior information about foreign equity markets relative to the investors in that particular country.

4.2 Impact on return variation

We next construct variance-ratio statistics to gauge the importance of private information on realized return variation. The ratios are presented in Table 9. The denominator in each ratio is the standard deviation of *realized* excess equity return in each of the countries. The numerator is the absolute value of the estimated γ_H ($\widetilde{\gamma}_H$) coefficients times the standard deviation of the corresponding measure of global private information. Again,

[31] In a previous version of the paper, we found that the total individual country trades (υ_t and $\tilde{\upsilon}_t$) also contained signficant private information about the cross section of returns. Thus our finding is not due to the selection of the global factor in the trades.

[32] In their structural VAR, Froot et al. (2001) find no impact from unexpected flows on subsequent returns in developed countries.

both measures of private information are constructed using instrument set C (lagged values of the flows, plus global and local instruments). These ratios estimate the impact of a one standard deviation shock to the global factor in the private information of US investors on international equity returns.

The table shows that the release of private information has a substantial effect on realized return variation over short holding periods. A one standard deviation shock to the broad measure of private information results in an increase in contemporaneous realized equity returns ranging from 8.8 per cent for Japan up to 17.5 per cent for the Netherlands. Over longer holding periods, the effect of private information is reduced but it continues to have an impact. For a three month holding period, private information accounts for 1.4 per cent of French realized returns up to 13.4 per cent of Italian returns. The impact of the conservative measures of private information is naturally smaller, accounting for 0 to 8 per cent of three month realized returns (for Japan and Italy, respectively). In addition, the global factor can account for 5.2 to 10.3 per cent per cent of realized US equity return variation based on the two measures.

4.3 Interpretation

Our results showing a global factor in the private information sets of US investors are in contrast with the perceived notion in the academic literature that investors in international equity markets trade mostly on specific knowledge about certain countries.[33] The most likely interpretation of a common factor in US investor private information is that it originates in superior information about US economic variables. This superior information may come from several sources. For example, US investors could have superior knowledge about US business cycle variation. Lumsdaine and Prasad (1999) estimate a common component in industrial production growth rates in seventeen OECD countries. The average weight of US industrial production in this common component is 38.92 per cent, well above the weights for all of the other countries. This common component is shown to drive industrial production in all of the countries. Kwark (1999) finds that shocks to US output are important in explaining shocks to foreign country output. Superior knowledge of US industrial production or aggregate output would then be of benefit in many countries.

US investors could also have a superior ability to interpret US monetary or produc-

[33] In the usual setup of the conventional view, conditional return correlations are assumed to be zero. If, on the other hand, conditional correlations of country index returns are, say, positive, investors perceive the assets as substitutes and trade on a country stock index after observing signals that are specific to another country's stock index. In this offshoot of the conventional view, the prices of both assets respond to each country's specific private information, making the private information global.

tivity shocks which would help in forecasting growth in foreign economies. Kim (2001) estimates several different identified vector autoregression models of the effects of US monetary policy shocks on the current account and foreign country growth. He finds that expansionary shocks to US monetary policy increase imports in the short run. It also causes higher growth in the non-US developed countries with much of the effect coming from a reduced real world interest rate. Glick and Rogoff (1995) analyze productivity shocks in the manufacturing industries of seven major industrial countries and find that gross investment responds to a global productivity shock.

Sophisticated investors may also gain an information advantage by monitoring the customer order flows of other investors. For example, the proprietary trading desks of large financial institutions will be able to observe order flows in many markets. In addition, sophisticated US investors may also have private knowledge about links between US firms and firms in particular foreign countries. This may arise from customer or supplier relationships or proposed merger or acquisition activity. Gehrig (1998) discusses the information externalities that are present in large financial centers such as New York.

The results in this paper are related to a growing literature which examines the effect of private information on portfolio stocks and flows. A number of papers have shown that foreign investors tend to hold those domestic securities that are more familiar to them. For example, Kang and Stulz (1997) find that foreign investors in Japan tend to hold shares of larger firms and firms with significant export sales. They argue that investors are likely to have more information about these firms (see also Choe, Kho, and Stulz (1999) for Korea). Similarly, Dahlquist and Robertson (2001) examine foreign ownership of Swedish firms and show that foreigners display a preference for firms with a significant presence in international markets (firms with a foreign listing or with high export sales), controlling for firm size. Presumably these firms have greater exposure to global factors in public and private information. Using a sample of 48 countries, Ahearne, Griever, and Warnock (2001) find that the share of a country's stock market that is publicly listed in the United States (a measure inversely related to private information) is an important determinant of the bias in US foreign stock ownership, even after controlling for a variety of instruments including transactions costs of trading in the country and direct barriers to foreign ownership.[34] Our results about foreign equity flows are not inconsistent with these results about foreign equity holdings.

As discussed in the introduction, the finding of a global factor in private information is consistent with those papers that show that foreign investors do not underperform

[34] See Coval and Moskowitz (1999) and Huberman (2001) for similar effects in domestic equity markets. There is also evidence that the volume of transactions between countries is correlated with measures of information flow (Portes and Rey (2000)).

domestic investors. It is also consistent with the results in Tkac (2001) who examines the performance of US managers of international open-end mutual funds during the 1990-1999 period. She finds that managers of well-diversified funds have significant positive Jensen alphas relative to a global equity index. In contrast, most managers of regional or country-specific funds do not outperform the appropriate benchmark fund. These results are to be expected as the global factor of private information will be relatively more important for well-diversified international mutual funds.

According to our results, US investors are likely to play a special role in international markets. Rather than suffering from an information disadvantage because of insufficient local information, they may enjoy an information advantage because of superior global information. At first sight, this view appears inconsistent with the home-bias puzzle. However, it is possible that being relatively better informed about their home market causes US investors to tilt their portfolios towards that market, or to securities more closely related to it. In other words, the ‘comparative information advantage’ which makes them hold the majority of US equities is consistent with an absolute advantage in holding foreign equities.

However, one issue that our analysis cannot address is the relevance of the global factor in private information across investors from different countries. For example, it may be that French investors have superior total private information about French securities as they have better country-specific information while having worse global private information. Hence, for these investors, the global factor in private information constitutes a smaller component of total private information.

4.4 Potential alternative explanations

Our measures of private information may be contentious as we have extracted them from monthly data and there are a number of potential alternative explanations for our findings. One potential alternative explanation is price pressure: unanticipated net inflows into a country’s equity market cause prices to rise even if they are devoid of information content as the market absorbs the extra demand. However, there are two primary reasons why the price pressure explanation is unlikely using our monthly data. First, the net flows shown in Table 1 are a very small portion of the total market value and the unanticipated net flows will be an even smaller portion. The markets that we examine are all in developed countries where there should be adequate liquidity for absorbing such small amounts. Second, if there were temporary price pressure impacts from unanticipated flows, then there should be immediate reversals. However, the effects remain positive as H increases.

A second potential alternative explanation is that idiosyncratic shocks are being recorded as trades due to private information. In principle, these shocks need not correspond to news about future asset payoffs. Instead, there might be shocks to individual wealth or preferences.[35] However, any such candidate shock affects the interpretation of our results only if the average shock (i) has persistent price impact *and* (ii) is not observable. Condition (i) arises because our measures help predict returns.[36] It suggests that our results are not driven by simple preference shocks that are iid over time (though correlated in the cross section), for example generated by a group of "noise traders" exerting "price pressure". Condition (ii) arises because we identify the average trade by US investors due to private information that is orthogonal to public signals and, under the conservative measure, orthogonal also to current returns. It suggests that we are not simply picking up an average of shocks to individual wealth. Such an average should be closely related to returns, and would be counted as 'public' by our conservative measure.[37]

The third, and potentially most serious alternative explanation, is that we are counting trades due to public information as trades due to private information. As mentioned above, this is a potential problem with our broad measures of private information where our instruments have beginning-of-month values. However, this is not a concern with our conservative measures of public information where our instruments have end-of-month values. Note that our conservative measures of private information base on information set C also include both the realized US equity return (in the global variables) and the realized local equity return (in the local variables). As mentioned above, using realized returns captures the impact of any public information variable that we have omitted from our flow regressions while also diminishing the private information effects. The fact that our conservative measures still have forecasting ability for future returns shows that our findings are not due to omitted public information.

Our analysis is also robust to omitted factors in the latent-factor model of returns. If the missing factor is a function of the public information variables that we have used, then the broad measures of private information are orthogonal to the missing factor and our results go through. If the missing factor is a function of omitted public informa-

[35] Indeed, we know that some trades by *some* agents have to be due to such shocks in order for *any* trades due to private signals to be valuable; i.e. signals are valuable only if prices do not reveal them. In the theoretical literature, this also requires that there is another unobservable factor, such as noise traders or supply shocks, driving prices. Of course, this factor need not affect trades by US investors.

[36] Of course, our results could be explained by serially correlated noise trader demands. But at some level, any pattern can be rationalized by a well-chosen noise distribution.

[37] The fact that our two measures are so similar thus confirms the finding of Bohn and Tesar (1996b) that portfolio rebalancing is not an important determinant of US investors' net trades.

tion variables, then the use of realized returns in the conservative measures of private information should capture this effect.

Finally, a potential criticism is that the model of expected equity flows does not impose enough structure to separate private information from portfolio inventory shocks or other microstructure type shocks (e.g. smoothing of the price process by the specialist, stale quotes, etc.). These microstructure effects are important at very short horizons of one day or less whereas our data is monthly. In addition, theory suggests a demanding test for measures of private information. The key insight is that private information partially revealed through trades causes a persistent impact on a security's price. Thus, a shock to private information is different from other shocks by its persistent price impact. This is what Tables 7 and 8 above showed for both the broad and conservative measures of private information.

5 Conclusions

Despite its increasing theoretical importance in accounting for several features of international equity flows and returns, there is little empirical evidence about the size and sources of private information and many important questions remain unanswered. This paper addresses some of these questions. In order to obtain measures of the private information of US investors, we estimate an empirical model of international equity flows. The models of gross purchases and sales of foreign equities by US investors work extremely well with an average $\bar{R}^2$ of approximately 65 per cent across our sample of eight countries. We show that modeling gross flows results in a better model of expected net flows than modeling net purchases directly. We then test for a factor structure in our measures of the total private information of US investors. The main or global factor accounts for over half of the variation in total private information.

We find that our measures of private information have a significant impact on the cross section of international equity returns. Although the trades of US investors constitute a very small amount of the total market capitalization of the foreign country, the unexpected flows are able to predict returns. The impact of measured private information is also large relative to realized return variation; a one standard deviation shock to US investors' global private information accounts for between 5 and 10 per cent of realized US equity return variation over a three month period. We show that our results are robust to potential "noise trading" by US investors, trading on omitted public information, and other potential model misspecifications.

Our results suggest that US investors are likely to play a special role in international markets. Rather than suffering from an information disadvantage because of insufficient local information, they may enjoy an information advantage because of superior global information. This information advantage appears to be long lived and suggests potential trading strategies where (sophisticated) US investors outperform the average non-US investor participating in the foreign equity market. More analysis is required to see whether this is possible. Our analysis simply shows that US investors have significant private information about the returns on the indexes of these countries. We do not analyze how to take an optimal position in the cross section of firms in these markets.

We have chosen to work only with developed country data to avoid complications with transition periods associated with emerging stock markets. However, work by Morck et al. (2000) shows that there is greater price co-movement in these markets as opposed to developed markets. This suggests that our findings may be even stronger in these markets.

Finally, our results must be incorporated into any examination of the home bias puzzle. It is clear from our results that there is a group of US (institutional) investors who have significant private information about foreign equity markets and that a substantial portion of this information results from a global factor. The results in Tkac (2001) cited above show that they can outperform appropriate benchmarks. This raises two questions. The first is why do other US investors not hire these institutions to allocate their portfolios in international equity markets? One potential explanation is the existence of agency problems between the client and the fund manager, yet this seems to be a less than satisfactory explanation as these problems would also exist in a purely domestic setting. For example, a US investor choosing among (domestic) US mutual funds faces the problem of deciding whether the fund managers have significant ability, part of which will include private information. Why is that investor's choice any different with respect to choosing an international fund manager? In both cases, the fund managers will have private information that the investor may never be able to obtain.

The second question raised by our analysis is whether US investors have an absolute information advantage across all equity markets through their better knowledge of the global factor in private information. This finding is also not inconsistent with the home bias puzzle, as it is likely that US investors have a 'comparative information advantage' in their own equity market. More research is needed on the composition of private information for investors around the world.

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Table 1a
Summary Statistics of US Investors' International Portfolio Equity Flows

The table shows summary statistics of US investors' gross purchases, gross sales, and net purchases of foreign equities from Germany, Japan, UK, France, Canada, Netherlands, Switzerland and Italy. All of the series are expressed in monthly per cent continuously compounded form. The series have been normalized by dividing by the market value of the foreign equity index at the start of the month, both expressed in US dollars. The sample period is January, 1977 to May, 2003. The three estimated autocorrelations of the series are for a one, six and twelve month lag, respectively.

	Mean (%)	Standard Deviation (%)	Autocorrelation ρ_1	ρ_6	ρ_{12}
US Investors' Gross Purchases of Foreign Equities					
Germany	0.196	0.152	0.870	0.764	0.697
Japan	0.176	0.175	0.943	0.896	0.884
UK	0.865	0.703	0.963	0.941	0.934
France	0.266	0.121	0.474	0.330	0.107
Canada	0.632	0.373	0.834	0.671	0.538
Netherlands	0.249	0.147	0.683	0.521	0.395
Switzerland	0.393	0.193	0.616	0.350	0.300
Italy	0.150	0.160	0.611	0.508	0.427
US Investors' Gross Sales of Foreign Equities					
Germany	0.186	0.152	0.915	0.811	0.746
Japan	0.161	0.163	0.962	0.941	0.920
UK	0.825	0.702	0.967	0.946	0.937
France	0.224	0.094	0.473	0.311	0.223
Canada	0.584	0.361	0.850	0.767	0.642
Netherlands	0.239	0.149	0.744	0.674	0.603
Switzerland	0.352	0.168	0.499	0.311	0.166
Italy	0.136	0.153	0.580	0.459	0.358
US Investors' Net Purchases of Foreign Equities					
Germany	0.010	0.061	0.311	0.116	0.097
Japan	0.015	0.049	0.539	0.032	-0.098
UK	0.040	0.109	0.271	0.102	0.143
France	0.043	0.114	0.281	0.125	-0.009
Canada	0.047	0.163	0.404	0.067	-0.023
Netherlands	0.010	0.102	0.365	0.076	-0.045
Switzerland	0.042	0.156	0.277	-0.034	-0.023
Italy	0.014	0.142	0.146	0.056	-0.022

Table 1b
Summary Statistics of Excess Equity Returns and Global Instruments

The table shows summary statistics of: (i) excess equity returns from the US, Germany, Japan, UK, France, Canada, Netherlands, Switzerland, and Italy; and (ii) the global instrument set: the US short-term interest rate (r_t^{US}), the US credit spread ($crsp_t^{US}$), the dividend yield on the global equity market (div_t^{all}), the slope of the US term structure (sl_t^{US}) and the excess returns on US stocks (rs_t^{US}) (shown in the first line of the table). All of the series are expressed in monthly per cent continuously compounded form. The sample period is January, 1977 to May, 2003. The three estimated autocorrelations of the series are for a one, six and twelve month lag, respectively.

	Mean (%)	Standard Deviation (%)	Autocorrelation ρ_1	Autocorrelation ρ_6	Autocorrelation ρ_{12}
Excess equity returns					
US	0.396	4.470	0.024	-0.001	0.013
Germany	0.170	5.888	-0.031	0.064	0.020
Japan	0.061	6.554	0.097	-0.002	0.052
UK	0.540	5.417	-0.040	-0.052	-0.083
France	0.531	6.628	0.030	0.014	-0.053
Canada	0.226	5.293	0.061	0.042	-0.105
Netherlands	0.501	4.926	-0.050	0.013	0.065
Switzerland	0.411	5.167	0.074	-0.029	0.003
Italy	0.400	7.439	0.067	0.093	0.063
Global instruments					
r_t^{US}	0.618	0.310	0.968	0.860	0.769
$crsp_t^{US}$	0.090	0.037	0.965	0.824	0.677
div_t^{all}	0.217	0.086	0.994	0.962	0.916
sl_t^{US}	0.067	0.154	0.925	0.684	0.496

Table 1c
Correlations of US Investors' Gross Purchases, Gross Sales, and Net Purchases of Foreign Equities with Foreign Excess Stock Returns

The table shows correlation coefficients of US investors' gross purchases, gross sales, and net purchases of foreign equities with the excess return on the stock market in that country. The flows data are presented in Table 1a while the excess returns are given in Table 1b.

	Gross Purchases	Gross Sales	Net Purchases
Excess return in:			
Germany	0.074	-0.004	0.193
Japan	0.030	-0.066	0.324
UK	-0.054	-0.056	0.015
France	0.117	0.024	0.104
Canada	0.111	0.021	0.207
Netherlands	0.108	0.037	0.102
Switzerland	0.055	0.003	0.065
Italy	0.121	0.040	0.094

Table 2a
Summary Statistics from OLS Regressions of US Investors' Gross Purchases of Foreign Equities on Different Information Sets

The table presents summary statistics from OLS regressions of gross purchases of foreign equities by US investors on four information sets: (A) six lagged values of the gross purchases; (B) lagged purchases plus the global instruments; (C) lagged purchases plus global and local instruments; and (D) lagged purchases plus lagged squared residuals from a vector autoregression of the US excess stock return, the foreign country excess stock return and the change in the exchange rate. The global instruments are detailed in Table 1b. The local instruments (all lagged one period) include: the foreign country's stock return; the foreign country's dividend yield; the difference in interest rates between the foreign country and the US; and the change in the spot exchange rate of the country's currency against the US dollar. The $\overline{R}^2$ statistics are adjusted for degrees of freedom. The value of the chi-squared test statistic associated with the Wald test of the null hypothesis that the coefficients on the explanatory variables are jointly equal to zero is shown in the column (χ^2) along with its asymptotic marginal significance level (*P*-value). In some of the tests, the degrees of freedom are adjusted lower due to multicollinearity of the regressors.

	Instrument Set							
	(A) lagged flows		(B) lagged flows + global instruments		(C) lagged flows + global + local instruments		(D) lagged flows + squared residuals	
	$\overline{R}^2$	χ^2 (6) for lagged flows *P*-value	$\overline{R}^2$	χ^2(5) for global variables *P*-value	$\overline{R}^2$	χ^2 (4) for local variables *P*-value	$\overline{R}^2$	χ^2(3) for squared residuals *P*-value
Germany	0.783	1073.27 <0.001	0.788	15.31 0.009	0.789	8.62 0.071	0.786	34.99 <0.001
Japan	0.906	2698.26 <0.001	0.907	10.84 0.055	0.908	5.52 0.238	0.904	7.81 0.554
UK	0.948	6453.80 <0.001	0.948	6.86 0.231	0.948	7.31 0.120	0.951	49.61 <0.001
France	0.313	207.54 <0.001	0.336	21.56 <0.001	0.340	5.87 0.209	0.318	20.56 0.015
Canada	0.734	977.39 <0.001	0.739	15.53 0.008	0.741	7.98 0.092	0.732	18.37 0.031
Netherlands	0.563	492.31 <0.001	0.583	25.63 <0.001	0.597	16.83 0.002	0.555	9.02 0.435
Switzerland	0.448	234.31 <0.001	0.465	15.59 0.008	0.471	10.34 0.035	0.451	18.17 0.033
Italy	0.493	285.04 <0.001	0.504	15.12 0.010	0.500	3.33 0.504	0.483	6.555 0.683

Table 2b
Summary Statistics from OLS Regressions of US Investors' Gross Sales of Foreign Equities on Different Information Sets

The table presents summary statistics from OLS regressions of gross sales of foreign equities by US investors on four information sets: (A) six lagged values of the gross sales; (B) lagged sales plus the global instruments; (C) lagged sales plus global and local instruments; and (D) lagged sales plus lagged squared residuals from a vector autoregression of the US excess stock return, the foreign country excess stock return and the change in the exchange rate. The global instruments are detailed in Table 1b while the local instruments are detailed in Table 2a. The $\overline{R}^2$ statistics are adjusted for degrees of freedom. The value of the chi-squared test statistic associated with the Wald test of the null hypothesis that the coefficients on the explanatory variables are jointly equal to zero is shown in the column (χ^2) along with its asymptotic marginal significance level (*P*-value). In some of the tests, the degrees of freedom are adjusted lower due to multicollinearity of the regressors.

	Instrument Set							
	(A) lagged flows		(B) lagged flows + global instruments		(C) lagged flows + global + local instruments		(D) lagged flows + squared residuals	
	$\overline{R}^2$	$\chi^2(6)$ lagged flow *P*-value	$\overline{R}^2$	$\chi^2(5)$ for global variables *P*-value	$\overline{R}^2$	$\chi^2(4)$ for local variables *P*-value	$\overline{R}^2$	$\chi^2(3)$ for squared residuals *P*-value
Germany	0.852	1540.57 <0.001	0.854	12.84 0.025	0.859	23.44 <0.001	0.851	13.14 0.156
Japan	0.945	2592.18 <0.001	0.945	4.87 0.432	0.945	6.11 0.191	0.946	18.23 0.033
UK	0.953	4983.23 <0.001	0.953	9.39 0.095	0.953	6.89 0.142	0.954	23.93 0.004
France	0.289	164.57 <0.001	0.315	19.82 0.001	0.311	7.26 0.123	0.287	24.00 0.004
Canada	0.780	1162.60 <0.001	0.779	10.49 0.063	0.782	9.55 0.049	0.776	8.46 0.488
Netherlands	0.644	708.51 <0.001	0.664	20.21 0.001	0.677	15.03 0.005	0.639	11.10 0.269
Switzerland	0.303	113.52 <0.001	0.311	9.58 0.088	0.320	11.10 0.025	0.299	25.63 0.002
Italy	0.434	205.21 <0.001	0.448	10.47 0.063	0.447	4.60 0.331	0.422	8.23 0.511

Table 2c
Summary Statistics from OLS Regressions of US Investor's Net Purchases of Foreign Equities on Different Information Sets

The table presents summary statistics from OLS regressions of net purchases of foreign equities by US investors on four information sets: (A) six lagged values of the net purchases; (B) lagged net purchases plus the global instruments; (C) lagged net purchases plus global and local instruments; and (D) lagged net purchases plus lagged squared residuals from a vector autoregression of the US excess stock return, the foreign country excess stock return and the change in the exchange rate. The global instruments are detailed in Table 1b while the local instruments are detailed in Table 2a. The $\overline{R}^2$ statistics are adjusted for degrees of freedom. The value of the chi-squared test statistic associated with the Wald test of the null hypothesis that the coefficients on the explanatory variables are jointly equal to zero is shown in the column (χ^2) along with its asymptotic marginal significance level (*P*-value). In some of the tests, the degrees of freedom are adjusted lower due to multicollinearity of the regressors.

	Instrument Set							
	(A) lagged flows		(B) lagged flows + global instruments		(C) lagged flows + global + local instruments		(D) lagged flows + squared residuals	
	$\overline{R}^2$	$\chi^2(6)$ lagged flow *P*-value	$\overline{R}^2$	$\chi^2(5)$ for global variables *P*-value	$\overline{R}^2$	$\chi^2(4)$ for local variables *P*-value	$\overline{R}^2$	$\chi^2(3)$ for squared residuals *P*-value
Germany	0.117	49.43 <0.001	0.119	7.19 0.207	0.130	10.20 0.037	0.130	28.96 0.001
Japan	0.310	178.42 <0.001	0.311	6.76 0.239	0.305	2.374 0.667	0.307	9.44 0.398
UK	0.166	59.25 <0.001	0.187	17.74 0.003	0.201	10.89 0.028	0.180	30.67 <0.001
France	0.135	32.24 <0.001	0.174	19.53 0.002	0.171	3.10 0.541	0.136	17.96 0.036
Canada	0.195	72.06 <0.001	0.218	16.27 0.006	0.229	6.96 0.138	0.186	10.33 0.325
Netherlands	0.164	85.03 <0.001	0.181	12.28 0.031	0.204	18.14 0.001	0.157	14.77 0.098
Switzerland	0.086	17.35 0.008	0.105	14.52 0.013	0.112	10.28 0.036	0.104	21.47 0.011
Italy	0.015	9.45 0.150	0.010	5.03 0.412	0.009	5.62 0.229	-0.002	9.866 0.361

Table 3
Variance Ratios and Specification Tests of Net Flow Regressions

The table presents two numbers to compare two ways to model expected net flows. The first number in each cell (var. ratio) shows the ratio of the variance of the expected net flow series constructed by the two methods. In the numerator, the expected net flow is obtained from a regression of the net flows on the given instrument set, as in Table 2c. In the denominator, the expected portion of the gross flows regressions from Tables 2a and 2b are used to construct an implied expected net flow. A number below 1.00 indicates that we obtain more explanatory power for net flows by using the expected gross flows to construct an expected net flow rather than by using the net flow in a regression directly. The second number in each cell (*P*-value) is the marginal significance level of a χ^2 test statistic from a regression of the net flows on the lagged gross purchases and sales. The test is that the coefficients on the lagged gross purchases are equal and opposite in value to the coefficients on the lagged gross sales. A small value indicates significantly different time series dynamics for the gross purchases and sales.

		Instrument Set			
		(A)	(B)	(C)	(D)
Country		lagged flows	lagged flows + global instruments	lagged flows + global + local instruments	lagged flows + squared residuals
Germany	var. ratio	0.306	0.387	0.461	0.365
	P-value	0.319	0.338	0.068	0.379
Japan	var. ratio	0.567	0.614	0.642	0.591
	P-value	<0.001	<0.001	<0.001	<0.001
UK	var. ratio	0.382	0.468	0.514	0.440
	P-value	0.052	0.186	0.037	0.116
France	var. ratio	0.624	0.738	0.771	0.668
	P-value	<0.001	0.743	0.559	0.176
Canada	var. ratio	0.391	0.462	0.543	0.416
	P-value	<0.001	0.123	0.015	0.006
Netherlands	var. ratio	0.459	0.873	0.929	0.490
	P-value	0.527	0.934	0.442	0.446
Switzerland	var. ratio	0.337	0.494	0.568	0.440
	P-value	<0.001	<0.001	<0.001	<0.001
Italy	var. ratio	0.158	0.291	0.357	0.207
	P-value	<0.001	<0.001	<0.001	<0.001

Table 4
Factor Analysis of Broad Measures of Private Information in International Portfolio Equity Flows

The table presents results of a factor analysis on the residuals from the gross flows regressions using beginning-of-month values of instrument set C (lagged flows, plus global and local instruments) shown in Tables 2a and 2b. The first column presents the cumulative variance of residuals explained by the first three factors obtained from an iterated principal factor analysis. The second column presents a chi-squared test statistic that the covariance matrix does not display a factor structure against an alternative one factor representation. The third column presents a chi-squared test statistic that the covariance matrix contains more than one factor. The latter two tests are obtained from a maximum likelihood analysis and are presented along with their marginal significance levels (*P*-values).

Factor	Cumulative Variance (%)	Test of 0 factors against 1 factor $\chi^2(7)$ *P*-value	Test of 1 factor against >1 factor $\chi^2(14)$ *P*-value
Gross Purchases			
1	0.526	105.74	32.87
2	0.743	<0.001	0.003
3	0.854		
Gross Sales			
1	0.553	80.32	14.14
2	0.748	<0.001	0.439
3	0.857		

Table 5
Summary Statistics of Regressions of International Excess Equity Returns on Global Instruments, Local Instruments, and Lagged Equity Flows

The table shows summary statistics from OLS regressions of the excess equity returns on US and foreign stocks on two instrument sets: (i) the set of global instruments shown in Table 1b; and (ii) the global and local instruments. The $\overline{R}^2$ statistics are adjusted for degrees of freedom. The value of the chi-squared test statistic associated with the Wald test of the null hypothesis that the coefficients on the explanatory variables are jointly equal to zero is shown in the column (χ^2) along with its asymptotic marginal significance level (*P*-value).

	(i) Global instruments		(ii) Global plus local instruments	
Country	$\overline{R}^2$	χ^2 (4) *P*-value	$\overline{R}^2$	χ^2 (4) for local *P*-value
US	0.019	9.301 0.054	0.018	0.815 0.665
Germany	0.038	14.654 0.005	0.046	5.868 0.209
Japan	0.032	13.455 0.009	0.030	4.873 0.301
UK	0.016	6.451 0.168	0.037	8.104 0.088
France	0.028	7.044 0.134	0.018	0.649 0.957
Canada	0.022	6.162 0.187	0.016	3.408 0.492
Netherlands	0.041	10.603 0.031	0.052	4.919 0.296
Switzerland	0.065	18.727 0.001	0.055	0.657 0.957
Italy	-0.003	3.128 0.537	-0.013	1.246 0.870

Table 6a
Coefficients on the Global Instruments in the One Latent Factor Model of International Stock Returns

The table shows the α_H coefficients on the global instruments in the latent factor model of international stock returns. The global instruments are a constant, the US short-term interest rate (r_{t-1}^{US}), the US credit spread ($crsp_{t-1}^{US}$), the dividend yield on the global equity market (div_{t-1}^{all}), the slope of the US term structure (sl_{t-1}^{US}) and the excess returns on US stocks (rs_{t-1}^{US}). The model is estimated separately by Generalized Method of Moments for each holding period of *H* months. The beta coefficient on the US stock return is normalized to 1.00 for identification. The small-sample adjusted version of the Newey-West standard errors (s.e.) are calculated assuming an overlap of *H+3* terms in the error process. The small-sample adjustment follows the procedure outlined in Ferson and Foerster (1994). The small-sample marginal significance levels (*P*-values) are shown below the standard errors.

	α_H coefficient in latent variable model					
Holding period	constant (s.e.) *P*-value	r_{t-1}^{US} (s.e.) *P*-value	$crsp_{t-1}^{US}$ (s.e.) *P*-value	div_{t-1}^{all} (s.e.) *P*-value	sl_{t-1}^{US} (s.e.) *P*-value	rs_{t-1}^{US} (s.e.) *P*-value
H = 0	0.006	-1.401	-7.905	4.805	-0.347	0.066
	(0.004)	(0.810)	(4.259)	(2.372)	(0.817)	(0.032)
	0.117	0.085	0.064	0.044	0.671	0.037
H = 1	0.039	-3.612	-38.642	13.864	-6.948	-0.006
	(0.013)	(1.731)	(12.215)	(5.033)	(2.766)	(0.029)
	0.002	0.038	0.002	0.006	0.013	0.841
H = 2	0.009	7.280	-88.045	16.024	9.597	-0.103
	(0.011)	(2.080)	(16.134)	(7.184)	(3.524)	(0.038)
	0.419	0.001	<0.001	0.026	0.007	0.007
H = 3	0.014	12.340	-113.657	7.848	16.036	-0.030
	(0.013)	(2.616)	(20.586)	(6.881)	(3.305)	(0.043)
	0.263	<0.001	<0.001	0.255	<0.001	0.488

Table 6b
Coefficients on the Implied Global Risk Premium in the One Latent Factor Model of International Stock Returns

The table shows the β_H coefficients on the implied global risk premium in the one latent factor model of international stock returns. The implied global risk premium is the linear combination of the instruments given in Table 6a. The beta coefficient on the US stock return is normalized to 1.00 for identification. The model is estimated separately for each holding period of *H* months by Generalized Method of Moments. The small-sample adjusted version of the Newey-West standard errors (s.e.) are calculated assuming an overlap of *H+3* terms in the error process. The small-sample marginal significance levels (*P*-values) are shown below the standard errors. The small-sample adjustment follows the procedure outlined in Ferson and Foerster (1994).

	Holding period			
	H = 0	*H = 1*	*H = 2*	*H = 3*
Country	β (s.e.) *P*-value	β (s.e.) *P*-value	β (s.e.) *P*-value	β (s.e.) *P*-value
US	1.000	1.000	1.000	1.000
Germany	2.107	1.248	1.096	1.152
	(0.878)	(0.326)	(0.187)	(0.187)
	0.017	<0.001	<0.001	<0.001
Japan	1.880	-0.127	-0.277	-0.735
	(1.106)	(0.406)	(0.262)	(0.277)
	0.090	0.755	0.292	0.008
UK	1.646	1.114	0.681	0.740
	(0.589)	(0.234)	(0.148)	(0.145)
	0.006	<0.001	<0.001	<0.001
France	2.557	1.952	0.812	0.829
	(1.158)	(0.486)	(0.238)	(0.193)
	0.028	<0.001	0.001	<0.001
Canada	1.966	1.230	0.183	0.179
	(0.599)	(0.223)	(0.153)	(0.165)
	0.001	<0.001	0.233	0.277
Netherlands	2.076	1.395	1.074	1.113
	(0.726)	(0.251)	(0.138)	(0.131)
	0.005	<0.001	<0.001	<0.001
Switzerland	3.388	1.681	1.492	1.237
	(1.467)	(0.378)	(0.229)	(0.190)
	0.022	<0.001	<0.001	<0.001
Italy	1.845	1.638	0.031	0.200
	(0.991)	(0.415)	(0.249)	(0.255)
	0.063	<0.001	0.902	0.434

Table 6c
Summary Statistics of the One Latent Factor Model of International Stock Returns

The top part of the table presents variance ratio measures of the statistical fit of the latent factor model. The ratio shows how the latent factor model without any private information captures the expected return variation in the data. The numerator is the variance of the expected return from the latent factor model while the denominator is the variance of the expected return from an OLS regression of the return on the global instruments. The bottom part of the table presents the value of the *J*-statistic associated with the Wald test of over-identifying restrictions of the model. The statistics are distributed as $\chi^2(40)$ and are presented along with their small-sample marginal significance levels (*P*-value).

	Holding period			
Country	*H = 0*	*H = 1*	*H = 2*	*H = 3*
Variance ratios				
US	0.320	1.384	1.924	2.132
Germany	0.581	0.641	0.874	0.943
Japan	0.140	0.003	0.026	0.174
UK	0.765	0.867	0.375	0.447
France	0.710	1.047	0.243	0.230
Canada	0.446	0.791	0.030	0.030
Netherlands	0.789	1.541	1.210	1.308
Switzerland	1.751	1.271	1.490	0.996
Italy	0.339	0.790	0.000	0.023
J-statistic model test				
$\chi^2(40)$	19.498	25.272	22.617	21.576
P-value	0.997	0.966	0.986	0.992

Table 7
Joint Significance Tests of the Effects of the Broad and Conservative Measures of the Global Factor in Private Information on International Stock Returns

The table shows the values of the chi-squared test statistics associated with the Wald tests of the null hypothesis that all of the γ_H ($\widetilde{\gamma}_H$) coefficients on the broad (conservative) private information measures are jointly equal to zero. In the first part of the table, the tests are for the joint significance of the broad measures of the global factor in private information of US investors across the equity returns in the U.S. and the eight foreign countries that are presented in Table 8a. In the second part of the table, the tests are for the joint significance of the conservative measure of the global factor in the private information of US investors across the equity returns of the same countries (Table 8b). The statistics are $\chi^2(9)$ distributed and obtained from a Generalized Method of Moments estimation of the model and presented with their small-sample marginal significance levels (*P*-values).

	Instrument Set			
	(A) lagged flows	(B) lagged flows + global instruments	(C) lagged flows + global + local instruments	(D) lagged flows + squared residuals
Broad measure				
H = 0	19.603	20.118	21.652	23.727
	0.021	0.017	0.010	0.005
H = 1	38.198	30.931	34.387	43.331
	<0.001	<0.001	<0.001	<0.001
H = 2	24.776	25.254	29.010	28.472
	0.003	0.003	0.001	0.001
H = 3	48.636	46.821	54.439	42.921
	<0.001	<0.001	<0.001	<0.001
Conservative measure				
H = 0		13.482	13.559	17.887
		0.142	0.139	0.037
H = 1		26.999	28.124	35.823
		0.001	0.001	<0.001
H = 2		19.175	24.995	25.892
		0.024	0.003	0.002
H = 3		30.706	30.214	38.728
		<0.001	<0.001	<0.001

Table 8a
Coefficients on the Broad Measure of the Global Factor in Private Information in International Equity Markets

The table shows the γ_H coefficients on the broad measures of the global factor in private information of US investors in the cross section of international stock returns. The coefficients are estimated separately for each holding period of *H* months but jointly across the equity returns of all of the foreign countries as in equation (4) by Generalized Method of Moments. The α_H and β_H coefficients are fixed at the values presented in Tables 6a and 6b. The small-sample adjusted version of the Newey-West standard errors (s.e.) are calculated assuming an overlap of *H+3* terms in the error process. The small-sample marginal significance levels (*P*-values) are shown below the standard errors. The values of the chi-squared test statistics associated with the Wald tests of the null hypothesis that all of the γ coefficients on the private information measures are jointly equal to zero are shown at the bottom of the table along with their small-sample marginal significance levels (*P*-values).

	H = 0	*H = 1*	*H = 2*	*H = 3*
Country	γ_0 (s.e.) *P*-value	γ_1 (s.e.) *P*-value	γ_2 (s.e.) *P*-value	γ_3 (s.e.) *P*-value
US	7.426	7.986	10.029	9.392
	(2.420)	(3.232)	(3.233)	(3.508)
	0.002	0.014	0.002	0.008
Germany	5.549	0.324	8.586	12.565
	(3.648)	(4.120)	(4.289)	(4.087)
	0.129	0.937	0.046	0.002
Japan	5.994	9.384	3.003	1.616
	(4.508)	(5.178)	(5.630)	(6.071)
	0.185	0.071	0.594	0.790
UK	8.523	6.769	10.409	6.954
	(3.026)	(3.828)	(3.648)	(4.042)
	0.005	0.078	0.005	0.086
France	10.010	2.676	2.863	1.982
	(3.419)	(4.180)	(4.119)	(4.909)
	0.004	0.522	0.487	0.687
Canada	8.256	9.223	5.635	12.074
	(2.659)	(3.296)	(3.034)	(3.946)
	0.002	0.005	0.064	0.002
Netherlands	8.910	7.914	8.904	7.311
	(2.714)	(3.545)	(3.323)	(3.874)
	0.001	0.026	0.008	0.060
Switzerland	6.222	-2.184	4.934	7.319
	(2.847)	(4.065)	(4.065)	(4.454)
	0.030	0.592	0.226	0.101
Italy	9.011	4.951	11.860	21.743
	(4.122)	(5.056)	(4.851)	(5.830)
	0.030	0.328	0.015	<0.001
Joint significance test				
$\chi^2(9)$	21.653	34.387	29.010	54.439
P-value	0.010	<0.001	0.001	<0.001

Table 8b
Coefficients on the Conservative Measure of the Global Factor in Private Information in International Equity Markets

The table shows the $\widetilde{\gamma}_H$ coefficients on the conservative measures of the global factor in private information of US investors in the cross section of international stock returns. The coefficients are estimated separately for each holding period of *H* months but jointly across the equity returns of all of the foreign countries as in equation (4) by Generalized Method of Moments. The α_H and β_H coefficients are fixed at the values presented in Tables 6a and 6b. The small-sample adjusted version of the Newey-West standard errors (s.e.) are calculated assuming an overlap of $H+3$ terms in the error process. The small-sample marginal significance levels (*P*-values) are shown below the standard errors. The values of the chi-squared test statistics associated with the Wald tests of the null hypothesis that all of the $\widetilde{\gamma}_H$ coefficients on the private information measures are jointly equal to zero are shown at the bottom of the table along with their small-sample marginal significance levels (*P*-values).

Country	$H = 0$ γ_0 (s.e.) *P*-value	$H = 1$ γ_1 (s.e.) *P*-value	$H = 2$ γ_2 (s.e.) *P*-value	$H = 3$ γ_3 (s.e.) *P*-value
US	-1.297	-1.019	3.770	4.567
	(2.050)	(2.797)	(2.559)	(3.350)
	0.527	0.716	0.142	0.174
Germany	-4.026	-6.780	2.244	6.960
	(3.236)	(3.898)	(3.645)	(3.944)
	0.214	0.083	0.539	0.079
Japan	-0.069	3.313	-0.008	0.006
	(4.542)	(5.587)	(5.933)	(6.194)
	0.988	0.554	0.999	0.999
UK	0.743	-2.892	4.889	3.079
	(2.703)	(3.735)	(3.206)	(4.020)
	0.784	0.439	0.128	0.444
France	-0.484	-4.429	-3.042	-3.995
	(3.244)	(4.077)	(3.698)	(4.358)
	0.882	0.278	0.411	0.360
Canada	-1.994	-2.151	-2.486	5.209
	(2.384)	(3.490)	(2.769)	(3.922)
	0.404	0.538	0.370	0.185
Netherlands	0.413	0.286	4.113	3.384
	(2.339)	(3.305)	(2.739)	(3.674)
	0.860	0.931	0.134	0.358
Switzerland	-0.878	-8.041	1.388	5.191
	(2.728)	(3.909)	(3.478)	(4.221)
	0.748	0.041	0.690	0.220
Italy	-1.193	-1.007	4.478	12.569
	(4.017)	(4.935)	(4.457)	(5.398)
	0.767	0.838	0.316	0.021
Joint significance test				
$\chi^2(9)$	13.559	28.124	24.996	30.214
P-value	0.139	0.001	0.003	<0.001

Table 9
Variance Ratio Statistics of Global Factor in Private Information in International Equity Markets

The numerator is the (absolute value of) the γ_H and $\tilde{\gamma}_H$ coefficients from Tables 8a and 8b, respectively, multiplied by the standard deviation of the corresponding measure of private information (Υ_t and $\tilde{\Upsilon}_t$, respectively). The denominator is the standard deviation of the realized excess stock return in the country.

Country	*H = 0*	*H = 1*	*H = 2*	*H = 3*
Broad measure				
US	0.160	0.120	0.126	0.103
Germany	0.091	0.004	0.083	0.105
Japan	0.088	0.093	0.024	0.011
UK	0.152	0.087	0.114	0.069
France	0.147	0.027	0.024	0.014
Canada	0.150	0.115	0.058	0.108
Netherlands	0.175	0.113	0.106	0.076
Switzerland	0.116	0.028	0.051	0.064
Italy	0.117	0.044	0.087	0.134
Conservative measure				
US	0.029	0.016	0.049	0.052
Germany	0.068	0.082	0.022	0.060
Japan	0.001	0.034	0.000	0.000
UK	0.014	0.038	0.055	0.031
France	0.007	0.047	0.027	0.030
Canada	0.037	0.028	0.026	0.048
Netherlands	0.008	0.004	0.050	0.036
Switzerland	0.017	0.106	0.015	0.047
Italy	0.016	0.009	0.034	0.080